Volunteer Lake Assessment Program Individual Lake Reports
ROBINSON POND, HUDSON, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	832	Max. Depth (m):	9	Flushing Rate (yr⁻¹)	1.3
Surface Area (Ac.):	88	Mean Depth (m):	3.3	P Retention Coef:	0.68
Shore Length (m):	2,900	Volume (m³):	1,189,000	Elevation (ft):	211

TROPHIC CLASSIFICATION

Year	Trophic class
1979	EUTROPHIC
1988	MESOTROPHIC

KNOWN EXOTIC SPECIES

Variable Milfoil
Fanwort

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Slightly Bad	The calculated median is from 5 or more samples and is > indicator and the chlorophyll a indicator is exceeded.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Oxygen, Dissolved	Encouraging	There are < 10 samples with 0 exceedances of criteria. More data needed.
	Dissolved oxygen satura	Slightly Bad	There are >10% of samples (minimum of 2), exceeding criteria.
	Chlorophyll-a	Slightly Bad	The calculated median is from 5 or more samples and is > indicator.
Primary Contact Recreation	Escherichia coli	Slightly Bad	There are >=1 exceedance(s) of the geometric mean and/or >=2 single sample criterion exceedances. Exceedances are <2X criteria.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Bad	There are >10% of samples (minimum of 2), exceeding indicator with one or more samples considered large exceedance.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

ROBINSON POND - TOWN BEACH	Escherichia coli	Bad	There are >=1 exceedance(s) of the geometric mean and/or >=2 single sample criterion exceedances. One or more exceedance is >2X criteria.
ROBINSON POND - CAMP WINAHUPE BEACH	Escherichia coli	No Data	No data for this parameter.
ROBINSON POND - TOWN BEACH	Cyanobacteria	Bad	Cyanobacteria bloom(s).

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.
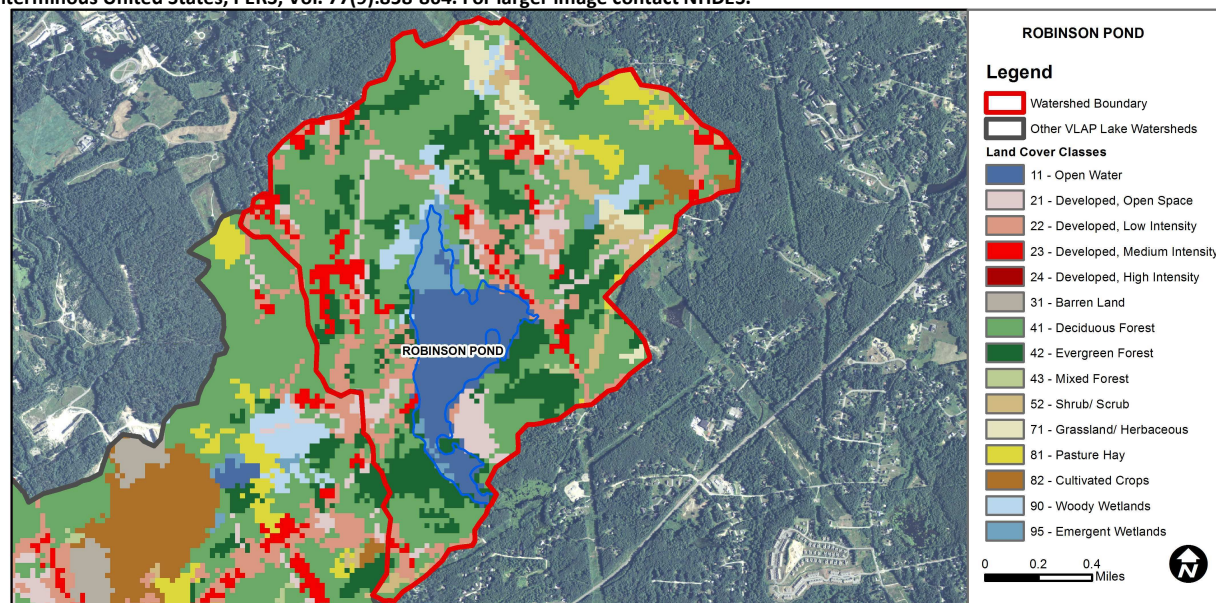
Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	8.96	Barren Land	0	Grassland/Herbaceous	2.54
Developed-Open Space	5.36	Deciduous Forest	41.72	Pasture Hay	2.24
Developed-Low Intensity	9.13	Evergreen Forest	15.64	Cultivated Crops	0.88
Developed-Medium Intensity	4.33	Mixed Forest	0.64	Woody Wetlands	2.29
Developed-High Intensity	0	Shrub-Scrub	3.66	Emergent Wetlands	2.63

OBSERVATIONS AND RECOMMENDATIONS (*Refer to Table 1 and Historical Deep Spot Data Graphics*)

- **CHLOROPHYLL-A:** Chlorophyll levels were elevated throughout the summer and concentrations ranged from 14.5 ug/L to 24.0 ug/L which were indicative of an algal bloom. The 2014 average chlorophyll level was the highest measured since 2006 and it was much greater than the state median. Historical trend analysis indicates a relatively stable chlorophyll level with moderate variability between years. Robinson Pond has experienced cyanobacteria blooms during the summer months and lake residents should notify DES immediately if any surface scums are evident.

- **CONDUCTIVITY/CHLORIDE:** Deep spot and tributary conductivity and chloride levels remained elevated and much greater than the state medians. Historical trend analysis indicates relatively stable epilimnetic (upper water layer) conductivity with moderate variability between years. Most of the tributary samples were collected in mid-May and potentially representative of spring snow melt conditions. The elevated levels in general were indicative of a more developed watershed with paved roadways, driveways and walkways that require the application of de-icing materials, typically salt, in the winter.

- **E. COLI:** Tributary E. coli levels were much less than the state standard of 406 cts/100 mL for surface waters.

- **TOTAL PHOSPHORUS:** Epilimnetic and metalimnetic (middle water layer) phosphorus levels were slightly elevated from June through September and were greater than the state median. Historical trend analysis indicates stable epilimnetic phosphorus since monitoring began. Hypolimnetic (lower water layer) phosphorus levels were greatly elevated and increased as the summer progressed and dissolved oxygen levels were depleted. Decomposition of organic matter on the pond bottom causes the depletion of dissolved oxygen which in turn causes the release of phosphorus from bottom sediments, a process called internal phosphorus loading. This internal phosphorus load likely contributed nutrients for cyanobacteria growth. Sta. 3, 6 and 7 experienced slightly elevated phosphorus levels in May during low flow conditions and these samples also were highly colored indicating the influence of tannic and humic acids and/or iron and manganese from the surrounding sub-watersheds. Sta. 4 phosphorus was slightly elevated in August and low water levels may have concentrated nutrients. Sta. 2 phosphorus was elevated in July following a significant storm event.

- **TRANSPARENCY:** Transparency remained stable from May through September, however historical trend analysis indicates significantly decreasing (worsening) transparency since monitoring began.

- **TURBIDITY:** Epilimnetic turbidity was slightly elevated from July through Sept. during the peak algal growth and potential cyanobacteria bloom. Metalimnetic turbidity was slightly elevated in May, Aug. and Sept. and greatly elevated in June and July indicating a layer of algae or cyanobacteria at that depth. Hypolimnetic turbidity increased as the summer progressed and was a result of the accumulation of organic compounds under anoxic conditions. Sta. 3 and 5 turbidities were slightly elevated in May due to low flow and a small amount of sediment in the sample. Otherwise, tributary turbidities were fairly low.

- **PH:** Epilimnetic and metalimnetic pH levels were within the desirable range 6.5—8.0 units on each sampling event. Hypolimnetic pH fluctuated below the desirable range. Sta. 6 experienced lower than desirable pH potentially due to the influence of naturally occurring tannic and humic acids.

- **RECOMMENDED ACTIONS:** Elevated conductivity and chloride remain a concern and it is recommended that local road agents and winter maintenance companies obtain a Voluntary NH Salt Applicator license through the UNH Technology Transfer Center's Green SnowPro Certification Program. This may help reduce salt application in the watershed during winter months. Educate watershed residents on ways to reduce salt application on driveways and walkways during winter months. The Green SnowPro website has educational materials for distribution. The consistently elevated algal and cyanobacteria growth this summer was concerning. Contact DES if any cyanobacteria scums are visible along the shoreline or in coves. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff in the watershed in order to reduce phosphorus loads. Educate watershed residents and local landscaping companies to use phosphate free fertilizers and implement stormwater management practices to capture and infiltrate stormwater prior to reaching streams and the pond. Keep up the great work!

Station Name	Table 1. 2014 Average Water Quality Data for ROBINSON POND									
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m NVS	Trans. m VS	Turb. ntu	pH
Epilimnion	14.4	18.57	50	218.0		16	2.54	2.33	1.99	7.23
Metalimnion				214.6		22			4.61	6.64
Hypolimnion				235.0		89			11.6	6.52
Sta 2 Launch Brook			68	313.5	50	31			0.89	7.08
Sta 3 Howard Brook			23	122.2	140	47			2.64	6.44
Sta 4 Juniper Brook			45	240.5	15	24			0.57	6.69
Sta 5 Stoney Lane Drainage			45	212.0	20	18			4.75	6.48
Sta 6 Woodcrest Brook			82	307.0	50	77			1.64	5.97
Sta 7 Row			110	409.0	60	31			1.29	6.36

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data moderately variable.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
pH (epilimnion)	Stable	Trend not significant; data show low variability.	Transparency	Worsening	Data significantly decreasing.
			Phosphorus (epilimnion)	Stable	Trend not significant; data show low variability.

Historical Trend Epilimnetic Conductivity and pH

Historical Deep Spot Chlorophyll-a, Epilimnetic Total Phosphorus & Transparency Data